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ALFRED HULSE BROOKS

Alfred Hulse Brooks, Chief Alaskan Geologist of the United States Geological Survey, and one of the leading geologists and geographers of the United States, died suddenly, November 22, 1924. Colonel Brooks was best known for his extensive work in Alaska, though he also served with distinction in France, as lieutenant-colonel and chief geologist of the American Expeditionary Force. He also filled many other responsible positions both within and without the Government service. One would search far for a better exponent of scientific administration in behalf of the public. Colonel Brooks' intense practicability, his power of thorough analysis, and his ready grasp of crucial points, made his advice widely sought and deeply respected, not only by his scientific associates but by men unversed in science, whether the highly educated engineer or the rough and ready prospector.

Colonel Brooks was a graduate of Harvard '94, following two years in German universities, and succeeded by postgraduate studies in the University of Paris. He was regularly appointed in the Geological Survey in 1894, following several years of temporary field service conducting topographic and geological work in the Appalachian region and Michigan. In 1898 he undertook his first Alaska work and more and more responsibilities were entrusted to him until in 1903 he was placed in full charge of the work of the Geological Survey in the Territory. Under his leadership the principal features of Alaska have been accurately mapped and its great mineral resources investigated, so that now we have a good working knowledge of the Territory. In this work Colonel Brooks was no "closet" geographer or geologist. Although he was always the first to share the credit with his subordinates, he himself made more trips to Alaska and tramped and canoed more miles through the northern wilderness than perhaps any other Alaskan explorer. The results of these trips are recorded in hundreds of different official volumes and on maps covering hundreds of thousands of square miles.

In 1911 he was appointed vice chairman of the first Alaskan commission to consider all possible railroad routes in Alaska—the forerunner of the present Alaska railroad.

Even before our declaration of war, Mr. Brooks was so imbued with his obligations to the military establishment that he entered one of the early training camps, and this training coupled with his demonstrated success in applying scientific principles to the problems that might be encountered by our troops, led him to be commissioned in the Officers' Reserve Corps, and early sent to France as the Chief Geologist. Here his knowledge of geology was immediately found to have an application to many phases of modern military problems.

Following the war Colonel Brooks was officially attached to the so-called Peace Commission, to which he furnished much information regarding the resources and possibilities of the Central Powers and those regions that would necessarily be considered in establishing a firm peace.

Among the distinguished honors accorded Colonel Brooks for his scientific attainments and contributions were the award of the Malte-Brun gold medal of the Geographical Society of France, the Daly gold medal of the American Geographical Society, and the honorary degree of D. Sc. of Colgate University. The following are among the various learned and technical societies of which Doctor Brooks was a member:

Association of American Geographers; American Association for the Advancement of Science; Geological Society of America; Mining and Metallurgical Society; American Institute of Mining Engineers; American Geographical Society; Explorers' Club; Washington Academy of Sciences; Societe Belge de Geologie; Geological Society of Washington.

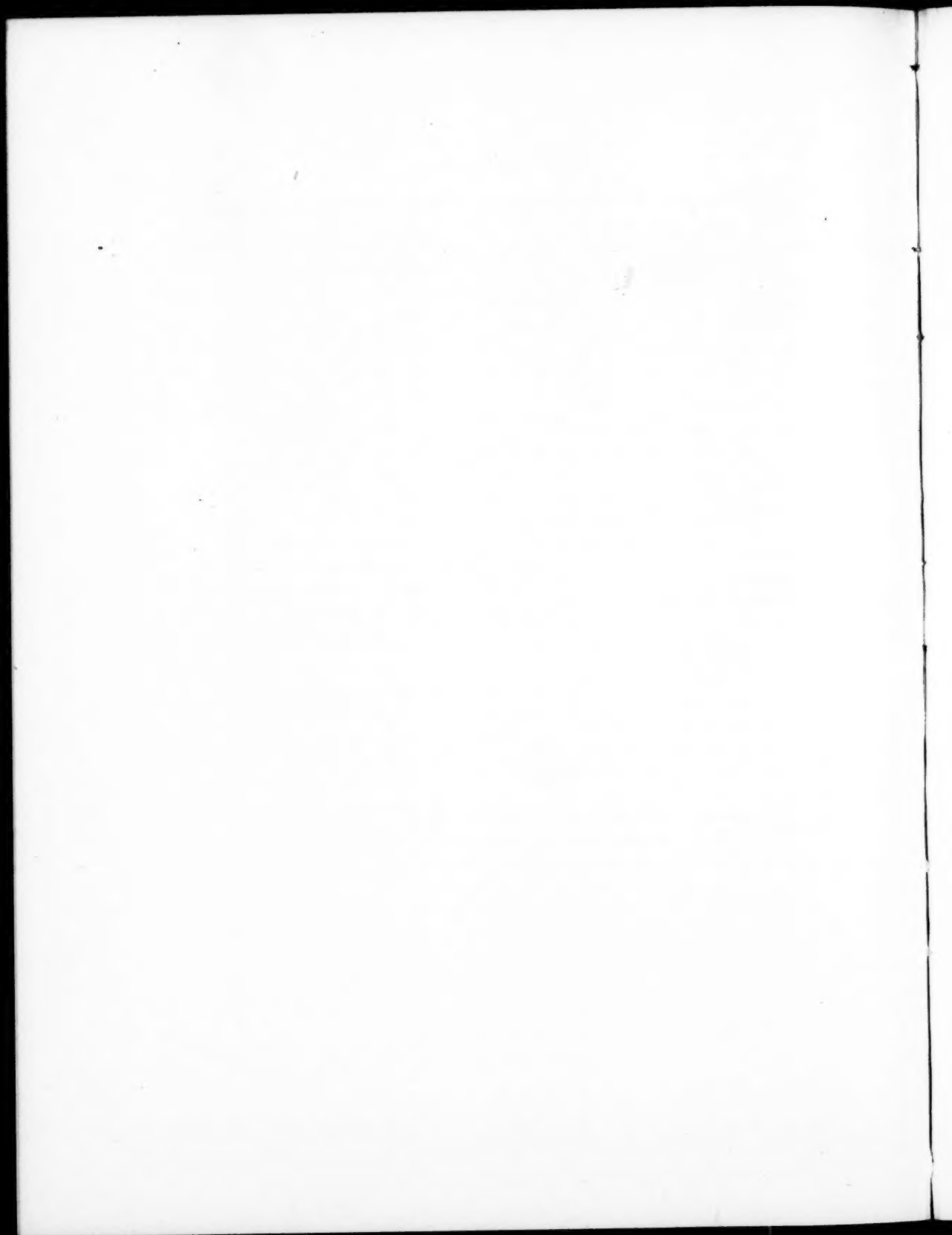
Doctor Brooks was born in Michigan, and was 53 years old, the son of Major Thomas Benton Brooks, an eminent mining engineer. He is survived by his wife, Mabel Baker Brooks, and a son and daughter.

He was an active member of most of the organizations concerned with the development of the sciences to which he devoted his life. His energetic participation in the direction of the affairs of the Association of American Geographers is well known, and it was only due to his own recognition of his failing health that more than once he refused to allow his name to be presented for the highest office in that society.

Brooks was well aware of his physical condition for several years, yet, with unassuming and steadfast courage, he bent every effort to

accomplish as much as he could of the task of faithfully portraying and lending his professional skill to the development of Alaska before his end should come. Inevitably this was a task that could never be completed, and while he had vast stores of information that had not been reduced to definite form, his work for so active a man of such wide interests was remarkably well rounded up. A book on Alaska on which he had worked intermittently for years was drafted in such form that it will be completed by his wife, who has always shared in his work in a particularly close manner. He had just finished an article that appeared in one of the late issues of the Geographical Review of the American Geographical Society. This article, his associates consider, is one of his best writings, and is the most authoritative statement on the potentialities of the Territory. The very day of his death Brooks was to present a lecture on the "Future of Alaska" to the Brooklyn Institute of Arts and Sciences. This last article had just been completed, the accompanying lantern slides stood on his desk, and he was just preparing to set out for this lecture when he was stricken. It has seemed particularly fitting that this article of his should itself form the finale of this memorial to our inspiring leader, our wise councillor, and our steadfast friend, Alfred H. Brooks.

Philip S. Smith



THE FUTURE OF ALASKA*

By ALFRED H. BROOKS

INTRODUCTION.—In spite of all the publicity that Alaska has had during the last twenty-five years, its possibilities are not yet fathomed, for less than half of its territory has been surveyed. A forecast of the future of this sparsely populated land must at the present time be based on information now incomplete, but which is increasing rapidly through the work both of the scientist and of the pioneers who are seeking financial betterment in the Northland. Because of this it is certain that the surmises which have long been circulated in regard to its future will soon give way to opinions supported by many very definite facts. Though Alaska was discovered in 1741 by Vitus Bering, a Dane in the Russian navy, it is only the present generation that has gained any true conception of the Territory. In the earlier days it was considered a barren polar land, valuable only for its furs.

It will be well to recall that many of the early opinions of the value of eastern America were unfavorable. The desperate struggle for life that was experienced by many of the first settlers on the Atlantic seaboard by no means convinced Europeans that the new land was suitable for settlement by the white race. The experience of the pioneers of the St. Lawrence, Massachusetts, Jamestown, and the Gulf of Mexico had raised serious doubts whether North America included anything but a tropical fever-stricken zone to the south and a barren polar zone to the north. This pessimism about the value of the Atlantic seaboard, exhibiting the ignorance of three centuries ago, suggests some of the present opinions on Alaska.

Had the Pilgrim fathers settled at Sitka, Alaska, instead of at Plymouth, they would have found milder climate, better soil and timber, and more game, furs, and fish. Indeed, pioneer life in southeastern Alaska was so much easier than that on the New England coast, the question might seriously be raised whether the hardy enterprise of Puritan stock would have been developed under these more favorable conditions.

Alaska, discovered when George Washington was still a boy, was first settled at the close of our Revolution. The Russians found their trans-Pacific colony difficult to administer and fully recognized its military weakness in time of war. Therefore, they gladly accepted Secretary Seward's offer of \$7,200,000 for the supposed polar land, and surrendered it to us in 1867.

*Published by permission of the Director of U. S. Geological Survey.

During the eighty odd years of Russian occupation the Territory yielded nothing but furs, and, indeed, no source of wealth except furs was believed to exist. For many years we held the same opinion. The country was so generally assumed to be a barren polar waste that for a quarter of a century no real administration of its affairs was undertaken. It was not until the great stream of placer gold from the Klondike, located in Canada near the Alaska border, stirred the world that the public began to realize that our northern possession might be of value. This was in 1896, since which time we have gained most of our knowledge of Alaska.

The American people have, in my opinion, been rather fed up on the adventure and hardship supposed to characterize all life in Alaska. It is, indeed, true that no other part of the continent has witnessed any greater display of endurance and heroism than that involved in the exploration and industrial development of our northern Territory. Yet, in the emphasis on the dramatic phases of Alaska life its industrial significance, which is of much greater importance, is often entirely neglected. Be it remembered that less than one-third of Alaska can, by location, climate, and vegetation, in any sense be classed as a polar land, and even this part is not without value to the human race. Most Alaskans obtain their first view of polar adventures in the moving pictures.

COASTAL BARRIER.—Alaska presents its most forbidding aspect toward the Pacific, where rugged snow and ice-covered mountains skirt the seaboard for some fifteen hundred miles. It was this coastal barrier, presenting the first glimpse of the new land to the approaching traveler, which gave the early explorers and the later tourists their deepest impression of the country. Mount St. Elias, over eighteen thousand feet in height, is the highest of the St. Elias group in Alaska. In 1891 the late Prof. I. C. Russell climbed to within 4,000 feet of the top and was prevented from reaching the summit by a severe storm. Some years later the top was actually reached by the Duke of the Abruzzi, who followed Russell's plan and route. The top of the mountain marks the international boundary between Canada and Alaska. Two hundred miles west of St. Elias are the wonderful Fairweather Mountains, nine to fifteen thousand feet high, rising directly from the sea. Viewing these makes it difficult to convince most tourists that Alaska is anything but a barren waste.

The snow and ice-clad barrier of the southern seaboard of Alaska, together with its contiguous and parallel high ranges, forms the Pacific

Mountain system. This system trends parallel to the Pacific for nearly a thousand miles, then, as does the coast, bends to the southwest and continues for five hundred miles. Having a width of from twenty to two hundred miles and summits from five to eighteen thousand feet high, it is the dominating feature of the North American cordillera. It finds a southern extension in the Coast Range of British Columbia and farther south in the Cascade and Sierra Nevada ranges.

Inland the Pacific Mountains of Alaska fall off abruptly to the Central Plateau region, which is of far lesser relief. This change affords a strong contrast in topography, for the snow-clad mountains with their steep-walled valleys, many of them glacier filled, give way to an open highland with flat-topped summits, broken by broad valleys and wide lowlands with gentle slopes. Here glaciers are entirely absent. To the south the land-slopes are rugged and have a forbidding aspect, while to the north they are gentle and inviting. The same contrast between the two provinces is expressed in their climates and vegetations.

The coastal region is by no means entirely of the rugged type which has been described, for in southeastern Alaska Alexander Archipelago intervenes between the high mountains and the sea. The mountains of these islands are lower and slopes are densely timbered.

It must not be thought that the rugged coastal barrier entirely cuts off access to the interior, for it is traversed by a number of railroads and wagon roads. On the map (Fig. 1, *Navigable Waters and Railroads*) the route of the government railroad, from Seward to Fairbanks, a distance of about five hundred miles, is indicated. The building of this railroad, though an arduous task, in view of the almost inaccessible nature of the region traversed, presented no very difficult engineering features, compared with many of the transcontinental lines. This magnificent enterprise has opened to settlement and development the great interior of Alaska, connecting the open waters of the Pacific with the Yukon River. It was completed in 1923 by the building of the bridge, seven hundred feet long, across the Tanana River. This bridge is located at the point the author swam his horses across the river some twenty years ago.

Previous to the building of this line, inland Alaska was accessible only during the season of open navigation, except by long sled journeys. The navigable waters of the territory are shown on the preceding map, Fig. 1. On this map and (Fig. 2, *Winter Ice, Glaciers and Perpetual Snow*) is indicated the fact that the Pacific Ocean is open to navigation throughout the year. The northern half of Bering Sea is closed by ice

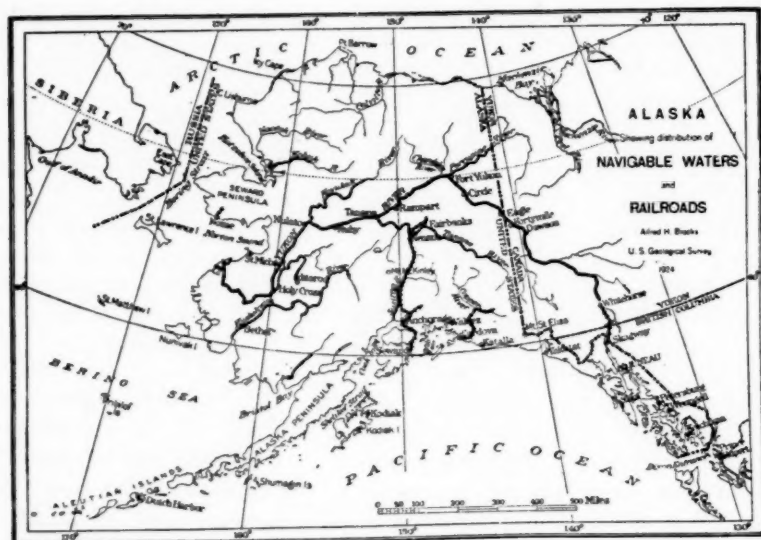


FIGURE 1

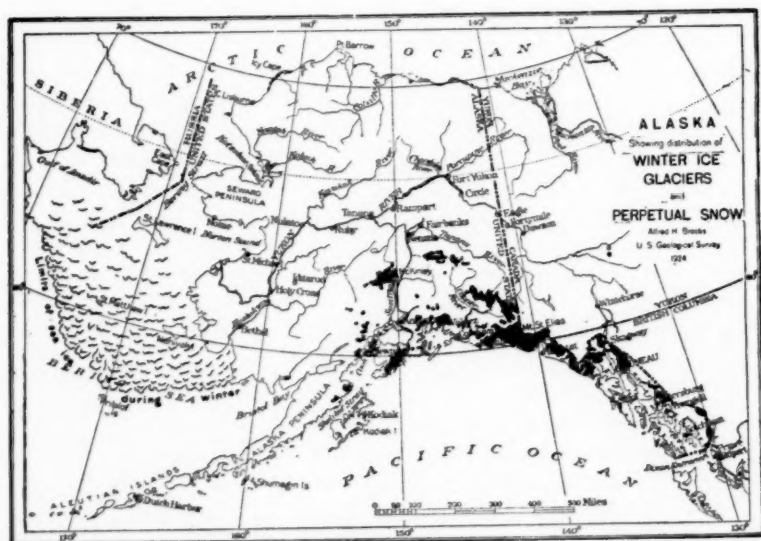


FIGURE 2

from October to July, while the Arctic Ocean is ice-blocked for much the larger part of the year. The navigable rivers of Alaska aggregate six thousand miles, but are closed by ice from about September 25 to May 15.

INLAND TRAVEL.—The gold seekers of the Klondike were forced to cross the coastal barrier to reach Dawson, on the Yukon, not far from the international boundary. The famous Chilkoot Pass afforded an arduous route across this barrier. The line of gold seekers, each bearing a heavy burden, was unbroken for three months in the year when thousands of people, both men and women, scaled the pass, some two thousand eight hundred feet in height. The White Pass, a few miles to the southeast, was of easier ascent. Over thirty thousand people crossed the coast range passage during the Klondike stampede, and their total equipment weighed some thirty thousand tons. Three years later a railroad (the White Pass Railroad) was built across this pass, and the most serious obstacle to inland travel ended. The coastal passes once crossed, the downstream journey afforded but few difficulties. The most serious obstacle was the White Horse Rapids. The rapids are not so dangerous as they appear, for though over ten thousand people shot them few lives were lost. A few years later transportation on the Yukon was by steamer. Thus has romance vanished along the main routes of travel.

GLACIERS.—It is generally believed that a description of Alaska must deal chiefly with glaciers, but glaciers and perpetual snow do not cover Alaska, the large glaciers all being confined to the Pacific slope of the high coastal barrier. The snow and ice fields of the Alaska seaboard (Fig. 2) do not extend beyond the high ranges of the south, and indeed cover in all only eighteen thousand square miles, which is three per cent of the entire Territory. I hope the time may soon come when writers no longer need announce the novel fact that Alaska is not covered with perpetual snow and ice.

PRECIPITATION.—The accumulation of permanent snow and ice demands a mean summer temperature of less than 32° (F.) and an abundant precipitation. Both the low summer temperature and abundant precipitation are found in the high ranges of the Pacific Mountains. The map (Fig. 3, *Mean Annual Precipitation*) shows that the Pacific coast of Alaska is bordered by a very wet zone with a precipitation of 60 to 160 inches. It is here that the winds of the Pacific drop much of their moisture on the high coastal barrier, and here is the glacial zone. Beyond these mountains, in the central region, the rainfall is only

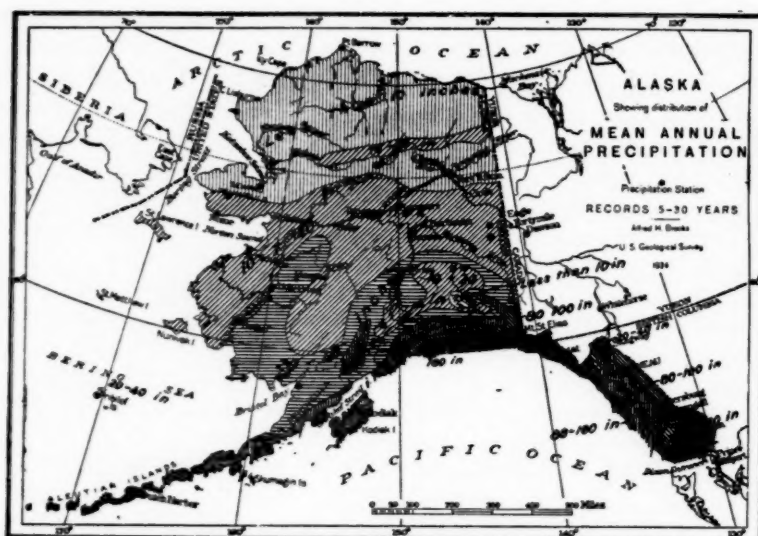


FIGURE 3

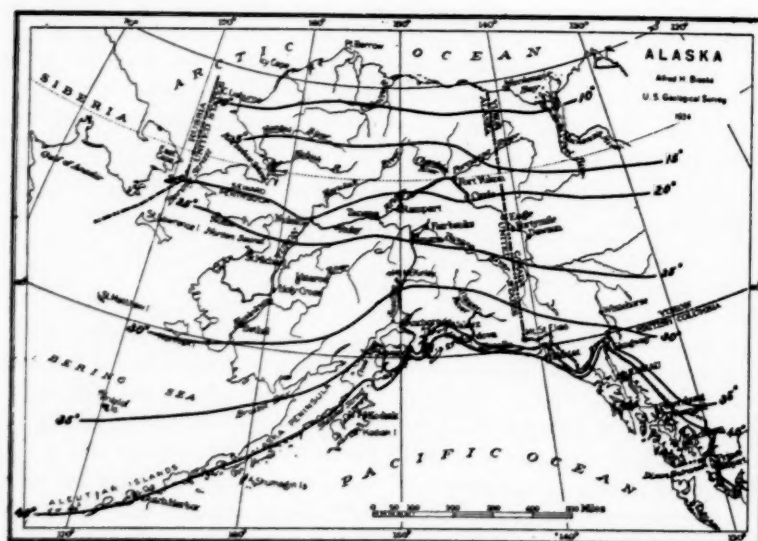


FIG. 4 Mean Annual Temperatures

10 to 20 inches, while in the extreme north bordered by cold seas the precipitation is only 8 to 10 inches.

TEMPERATURE.—Alaska stretches through 17° of latitude. Its southern seaboard is bathed by the warm waters of the Pacific, while to the north it is thrust into the ice-bound Arctic Ocean. Consequently, its Pacific littoral has (Fig. 4 *Mean Annual Temperatures*) a mean annual temperature of about 40° (F.), about the same as that of the Province of Ontario, while that of polar Alaska is 10° (F.), equal to that of northern Hudson Bay. The mean annual temperature decrease is about $2\frac{1}{2}^{\circ}$ (F.) to every degree of latitude from south to north. The winter temperature of the southern seaboard is about 30° (F.), approximately equivalent to that of New York, while the 0° isotherm in January runs through the heart of Alaska, trends to the southeast through Canada and crosses North Dakota. Therefore, even winter temperatures of Alaska occur in the well populated areas of North America. The summer temperature of over half of Alaska in July is from 50° to 55° .

Alaska includes three general climatic provinces (compare with the *Physiographic Provinces*, Fig. 5): (1) The Pacific littoral, which has cool summers, warm winters, and abundant precipitation. In this region there is no great fluctuation of temperatures. (2) The central region with its long cold winters and short warm summers and the precipitation of a semi-arid region. Extremes of temperature in the central region vary from -60° (F.) in winter to $+90^{\circ}$ in summer. (3) The polar region with very long cold winters, very short cold summers and very low precipitation.

SIZE AND POSITION.—Many people gain their knowledge of the size and position of Alaska from the ordinary map of North America, which shows it as a comparatively small peninsula thrust out toward Siberia and the Polar Sea. A better conception of the extent of the Territory can be obtained if Alaska is superimposed on the United States. Its dimensions in fact are comparable to those of the United States, extending from the Atlantic to the Pacific seaboard and from the Mexican to the Canadian boundary. You can understand the absurdity of a traveler who has visited the Pacific seaboard of Alaska being regarded as an authority on the Territory, just as if the tourist who had made a trip from Charleston, S. C., to the Missouri, were regarded as an authority on California or Montana; this misconception of the size of the Territory leads to many errors in the understanding of its climate, resources, and physical features.

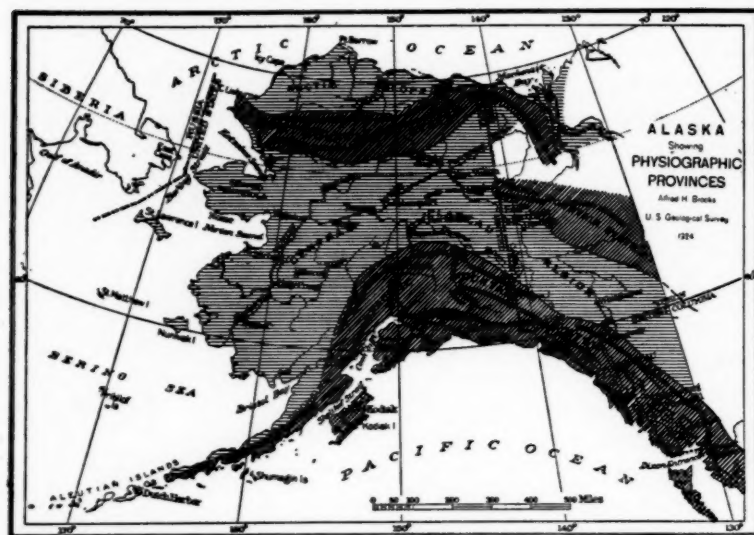


FIGURE 5

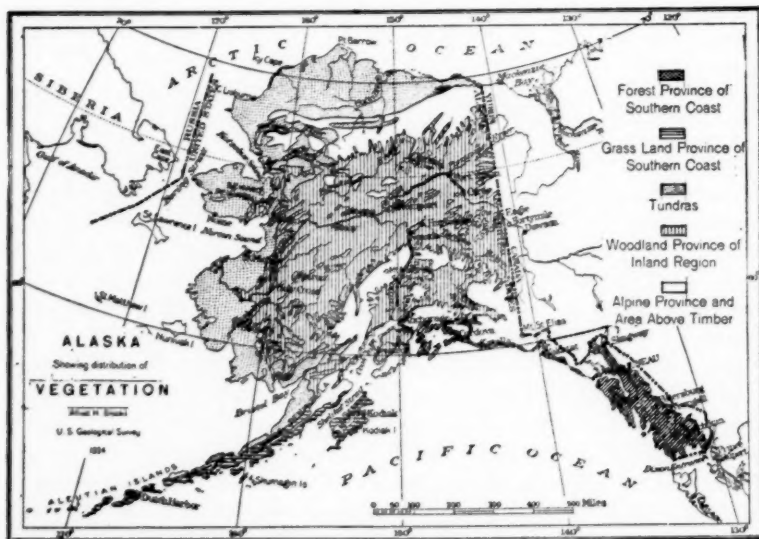


FIGURE 6

Alaska has about the same latitude as Scotland and the Scandinavian Peninsula. Its westernmost meridian is in the eastern hemisphere, and has the same longitude as New Zealand.

VEGETATION.—It has already been pointed out that the Pacific Mountain system is the dominating element of Alaska's relief (Fig. 5, *Physiographic Provinces*), and that it can be traced southward through Canada and the United States. Two hundred miles to the north is the Arctic Mountain system, forming a highland belt of parallel ranges about 100 miles wide and having a crestline three to seven thousand feet above sea level. These mountains stretch east and west across Alaska, parallel to the Polar Sea, and form the second great highland belt of the Territory. Between these two highlands is an area of lesser relief, the Central Plateau region. The southern highlands cut off the central region from the warm moisture-laden winds of the Pacific, those to the north shelter it from the cold winds of the Polar Sea. North of the Arctic Mountains is a belt of highland and coastal plain with its polar climate and vegetation. The climate of this province has already been described and it remains to describe its vegetation.

The visitor is usually amazed by the almost tropical character of the vegetation of southeastern Alaska (Fig. 6, *Vegetation*), where timber occurs at elevations as high as two thousand to three thousand feet. Here is found large spruce, hemlock and some cedar. The two national forests of southern Alaska contain pulpwood forests which could yield 2,000,000 cords annually. To the north and west the timber of the coastal belt is lighter and there is more grassland. In the latitude of Kodiak Island the timber is absent, but grass grows luxuriantly and here is a large area of pasture available for cattle and sheep. This coastal vegetation is in strong contrast to that of the inland region, where the forest is open and the trees are of comparatively small size. The inland forests have no value for pulp or export lumber, but are extensively used locally both for fuel and structural material. The large open valleys of the Yukon are covered with open forests (mostly spruce) and grass. In addition to the spruce, there is some white birch and cottonwood. This type of topography and vegetation extends northward to the base of the Arctic Mountains, which have an alpine vegetation. North of the Arctic Mountain slope the vegetation is entirely polar. The short growing season and other physical conditions prevent the growth of any woody plants, except willow. The dominating vegetation is grass, moss and lichen, with willows along water courses. Near the

border of the Arctic Ocean are broad plains of the type of land which forms the barren ground. The reindeer pastures show that there are sources of food even in polar Alaska. There are now about 300,000 reindeer in Alaska and pasture enough to support several million.

The foregoing statements will, it is hoped, give you a fair understanding of the typical vegetation of the larger provinces of Alaska. On the map (Fig. 6) the two great mountain chains are shown to have an alpine vegetation, which means the absence of timber and pastures. In between is the Central Plateau region of open woodland and grassland. Along the Pacific seaboard there is heavy forest to the southeast and abundant grasslands to the southwest. The northwestern part has a tundra vegetation, made up of moss, lichen, and scant grass, and stunted willows. The southern province has valuable forests and pastures. The central region includes most of the agricultural lands. The tundra has only reindeer pastures. The alpine region of the mountains has no present or future value in soil products.

AGRICULTURE.—Under the prevailing conception of Alaska as a polar region, the public is slow to believe that it contains any agricultural resources. Even its residents were once skeptical on this matter, and during many years the gold miner and the fur trader, as the Russian before them, imported all their food stuffs except fish. Compared with the countries of northern Europe, Alaska has large areas of tillable and pasture lands. The summer climate, as already shown, has a growing season which is ample for many of the hardier crops. It is only within the last twenty years that any food stuffs were raised in Alaska, and the agricultural development of the Territory is still in its infancy. Its immediate future depends on the local market rather than on the climate.

Potatoes formed the first crop successfully matured and the Territory now supplies most of its own needs. They are raised in many sections which are outside of the areas here classed as agricultural lands, but grow best in the Fairbanks district, and at other localities near the government railroad.

It has long been known that the hardier grain, such as oats, rye, and barley could be matured in Alaska, and ten years' experience shows that wheat can be raised at Fairbanks, which is near the center of the Territory, and at other favored localities. Indeed, at Fairbanks there is a commercial flour mill, built by farmers, which supplies the local community with flour. Market gardening is profitable in many localities. The physical conditions controlling Alaska agriculture show that

there are large areas in which farming and stock raising are commercially practicable. The map (Fig. 7, *Arable Land*) shows what is now known of the distribution of soils favorable to agriculture. These agricultural lands are chiefly in the interior where the summers are comparatively hot. Here the growing season is 80 to 105 days, which is favorable to many grains and in some localities to wheat. Root crops and hay can also be raised. The average temperature of the coastal region is also favorable to agriculture and grass, and the growing season is 120 to 130 days. In this region the raising of timber and the pasturing of cattle and sheep are the most important uses of the land. North of these areas noted as agricultural are many localities where some crops can be raised during favorable seasons.

Alaska has no immediate future for a large farming population, but in time to come, the over-population of more favored regions will lead to the development of the farm lands. Meanwhile, the building of the railroad will promote farming operations sufficient to meet the local demand of a population attracted by the wealth of minerals and fisheries. Alaska has enormous areas of government land open to the homesteader. The use of these presents no greater hardships than beset the pioneer of other remote regions. The clearing of the land is easily accomplished. A chicken ranch in this northern region presents some unusual difficulties, for the long summer days demand that the chicken house be closely shaded to encourage the chickens to the necessary rest; on the other hand, the darkness of winter discourages them from arising promptly in the morning and attending to their vocation. This is met by the use of electric lights in the chicken house.

FISHERIES.—Fishing has long been one of the most important of the Alaskan industries, sixty million dollars now being invested. The value of its product is over forty million dollars, and it employs thirty-five thousand men. Eight-tenths of the value of Alaska fish is in salmon, which is the greatest fish food of the world. The salmon, a salt-water fish, spends most of its life at sea, but spawns in fresh water. At the spawning time the salmon makes every effort to reach the spawning ground even by the ascent of falls. During the spawning season the fish are caught in large numbers. It is sometimes asserted that Alaska salmon fisheries are rapidly being depleted. It is true that under the old law there was danger of such extermination of the salmon, but this is not true since the passing of the more stringent conservative law of the present. In addition to salmon, Alaska also has very valuable herring, cod, and halibut fisheries.

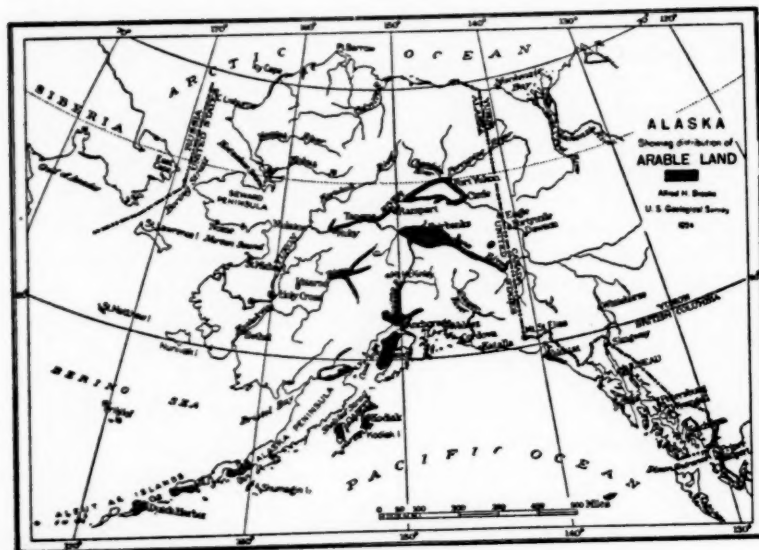


FIGURE 7

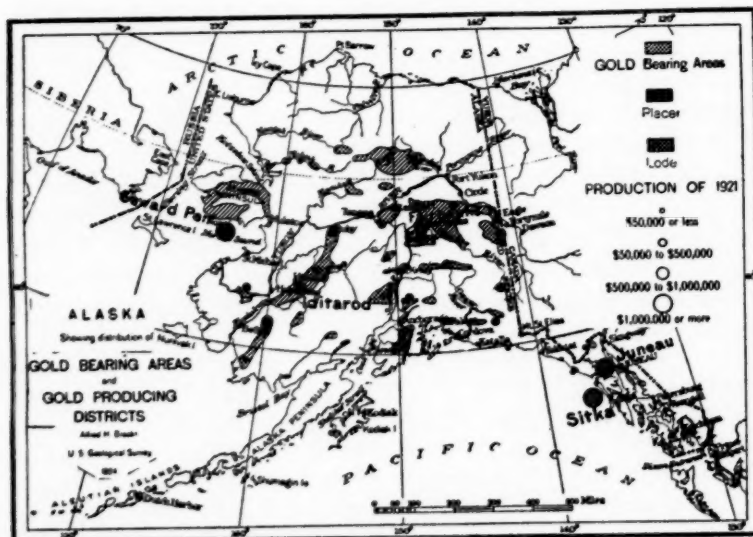


FIGURE 8

MINING.—Gold mining was long Alaska's most important industry, and only lately has it been rivaled by her fisheries. The exploitation of rich gold placers, or bonanzas, as they are termed, not only gave mining its start, but for many years has been the mainstay of the industry. These rich deposits occur in sand and gravel and could be exploited with very simple equipment, the installation of which required only little capital. The very wide distribution of gold in Alaska is shown on this map (Fig. 8, *Gold Bearing Area and Gold Producing Districts*).

Bonanza mining reached its maximum output seventeen years ago, but that by no means spelled the decline of the industry. In every placer district bonanza deposits are of small extent compared with the auriferous gravels containing a lower percentage of gold. Furthermore, it is safe to say that lode mining has but fairly begun in Alaska, though it has already produced over a hundred million dollars worth of gold.

The lower grade placer deposits which can not be profitably excavated by simple means are profitably mined by use of dredges. Machines such as this will do the work of two hundred to three hundred men. Twenty-four dredges are now in operation, producing \$1,800,000 worth of gold annually. Alaska has large reserves of low grade placer deposits.

Next to gold, copper is the most valuable mineral produced in Alaska. The map (Fig. 9, *Copper Bearing Areas*) shows the wide distribution of the copper producing districts. You will note that these are all near railroads or the ocean, for this metal cannot be produced except where there is cheap transportation. The Kennicott copper reduction plant is the largest in the north. To reach this a 200-mile railroad was built from the coast at a cost of twenty million dollars, which is supported almost entirely by the copper output. The other metals produced in Alaska are silver, tin, platinum, lead, tungsten, antimony, chromite, and quicksilver.

Not all of Alaska has been explored, geologically. The known fields of coal contain 30,000,000 tons of coal. The larger coal areas of North America fall east of the western mountains. Therefore, the Alaska coal will eventually be used to supply the west coast. The map (Fig. 10, *Coal and Petroleum*) shows the distribution of Alaska coal and also the petroleum which occurs in a number of localities. Especially important are the coals which lie close to the government railroad. Alaska supplies ample mineral fuel for her own population as well as some for export.

COMPARISON OF RESOURCES.—In considering the commercial possibilities of Alaska, we should take a glance at its present accomplishments. The diagram (Fig. 11) shows that Alaska has shipped one billion one hundred and forty-four million dollars worth of raw material to the States. This has consisted primarily of fish and minerals, but also includes a large amount of fur, of which sealskins have

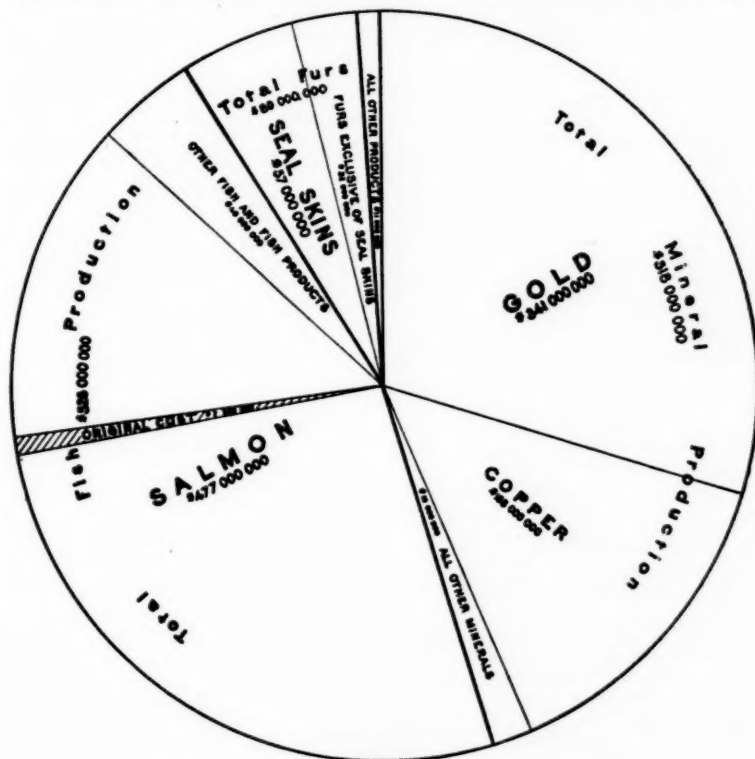


FIGURE 11. Total Production of Wealth Since 1867

been most valuable. The fur seals occur only on the small group of islands in Bering Sea, where there are now some 600,000 animals. These islands have produced over \$58,000,000 worth of skins since Alaska was acquired. The seal industry is continuing under close Government supervision, and the seal herd is increasing. Of minerals, the gold output has been the most valuable, copper being second. The

value of the fisheries rests largely in the salmon which gives assurance of continued productivity. In forming an estimate of Alaska's value one usually compares it with the most favorable parts of the United States. There can be no question that Alaska is less valuable than the States, for its climate is inferior to that of California; there are better grain lands in the northwest; more coal in Pennsylvania; and other similar comparisons to the disadvantage of the northern territory may be made. In this (Fig. 12) table is offered a comparison of its resources

		ALASKA	SWEDEN	FINLAND
AREA	Square miles	586,400	173,550	144,250
AGRICULTURE AND FORESTRY:				
Farming and grazing land	Square miles	94,000	24,300	9,500
Cultivated land	Square miles	9	19,300	6,000
Agricultural population		1,009	2,663,000	About 1,000,000
Reindeer pasture	Square miles	240,000	40,000	8,000
Woodland	Square miles	181,000	82,000	79,000
Good timber	Square miles	31,000	?	61,000
MINERALS:				
Placer gold reserves		\$360,000,000	None	None
Lode gold reserves		Very large	None	None
Copper reserves		Very large	Small	Very small
Iron reserves	Tons	Probably large	442,000,000	3,600,000
Platinum, tin, chromite, antimony, mercury, sulphur		Commercial deposits	None	None
Marble		Large deposits	Little	None
SOURCES OF POWER:				
Coal land	Square miles	12,000	309	None
Petroleum		Probably large reserves	None	None
Total water power	Horsepower	2,800,000	3,500,000	1,500,000
Total developed water power	Horsepower	50,000	1,100,000	165,000
FISHERIES:				
Fish exported in 1913	Pounds	Very extensive 267,000,000	Extensive 100,000,000	Extensive 20,000,000
COMMUNICATION:				
Railroads	Miles	755	7,000	1,900
Wagon roads	Miles	1,030	38,630	27,240
POPULATION:				
Total		(1913) 54,890	(1913) 5,429,600	(1908) 2,712,550
Per square mile		0.1	32	19

ALFRED H. BROOKS
U. S. GEOLOGICAL SURVEY

FIG. 12 Comparison of Resources of Alaska, Sweden, and Finland

with those of the northern countries of Europe. It shows that the area of Alaska is three times that of Sweden and four times that of Finland. If we compare the agricultural lands we find that there are much larger areas than in either Sweden or Finland. You will notice also that the mineral resources of Alaska are greater than those of northern Europe. It also has water power comparable with either Sweden or Finland. A

careful study of this table will convince anyone that from the standpoint of both resources and climate, we are justified in believing that Alaska will maintain a population per square mile at least as great as that of Finland. In fact, we may confidently expect that the time will come, when Alaska will support a population of 10,000,000 people.

CHANGES IN ENTREPOT MARKETS FOR TROPICAL AND OTHER EXOTIC PRODUCTS*

BY HELEN M. STRONG

INTRODUCTION.—During the last ten years international traffic in many tropical products has been more or less rerouted. Formerly, most of these commodities reached the United States via Suez and the entrepot markets of the United Kingdom, Germany, Netherlands, Belgium and France, but now the greater share of those from the Middle East, which includes roughly India, southeast Asia, and the Islands from Sumatra to New Guinea, goes direct to the United States through either Suez or Panama. Those using the Panama Canal are in most cases trans-shipped at Pacific Coast ports from trans-Pacific to intra-coastal steamers. Consignments from the Gold Coast of Africa and the west coast of South America are usually sent direct to the United States.

CAUSES OF CHANGES.—The war, of course, caused a sudden change in ocean trade channels, but to it by no means can be attributed this permanent shift which has occurred both in trade routes and in entrepot markets. Probably the three most significant elements which influence routing of traffic are (1) time in transit, (2) the directness of the service, and (3) the freight rate. With the opening of the Panama Canal in 1915 there came into existence an entirely new group of potential trade relations such as those between the Orient and the east coasts of North and South America, the Orient and northwest Europe, the western coast of South America and the eastern shores of North America, and the eastern and western coasts of the United States.

The Panama Canal would have tended to reroute ocean shipping even though there had been no war. Direct service from the United States to the Orient via Panama or Suez and to the Gold Coast as well as the growing foreign trade of the United States have also factored in redirecting considerable ocean trade. These forces act and react so as to both further expand the commerce of the United States and to bring this country more and more into direct relations with its export and import markets.

AGRICULTURAL AND FOREST PRODUCTS.—Products from tropical and adjacent subtropical regions make up almost the entire value of agricultural imports, and comprise, together with such exotic commodities as silk, nearly one-third of the total imports into the United States. Such prewar purchases totaled about \$600,000,000, and those for 1923 amounted to nearly \$2,000,000,000. These frostless regions with warm

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climate and abundant rainfall well distributed throughout the year produce crops which cannot be raised elsewhere. They supply also certain mineral resources such as tin, magnesite, and nitrate which are not known to exist in large quantities in other places. Silk from China and Japan, coffee from the Sao Paulo region of Brazil, and camphor from Formosa, are raised on the margins of the areas having continuous warm temperatures. Yucatan sisal is grown in a region characterized by absence of frost, deficient rainfall, and a wet and dry season. Consequently these regions monopolize the production of such crops, native vegetable products, and mineral resources, and thither, nations of mid-latitudes must go for some of their food and essential raw materials.

Four commodities, namely silk, sugar, coffee, and crude rubber comprise more than half of all the tropical, subtropical, and exotic imports into the United States, amounting to more than \$1,000,000,000 in value, while several others such as petroleum, tin, nitrate, goat skins, cacao, and shellac are worth respectively \$20,000,000. Quebracho, the principal tanning compound imported, is also a subtropical product, while drugs essential in medicine such as coca, from which cocaine is produced, and quinine or cinchona come from trees growing in tropical forests. Chicle, the dry milky juice of a tropical American tree, is the basis of chewing gum. The varnish industry depends upon such tropical gums as shellac, copal, kauri, and damar. Other tropical products of great industrial importance such as jute which goes into gunny sacking; manila hemp, the long strong water resisting fibre used in rope; sisal, the binder twine fibre; bananas, copra, coconut oil and palm oil, and camphor might be mentioned.

DISTRIBUTION OF TRADE BY CONTINENTS.—Asia, Europe, North America, and South America before the war accounted for 99 per cent of all tropical products imported into the United States, the remaining 1 per cent coming from Africa and Oceanica, but statistics for 1923 show a somewhat different distribution, for nearly half of these commodities come from Asia, about 30 per cent from North America, and approximately 14 per cent from South America. Of the remainder, Oceanica supplied about 2 per cent and Europe the balance. The significant change in the source of these tropical imports is the shift in proportions for Europe and Asia. Europe, of course, produces no tropical products, since none of its area lies in tropical regions, but by virtue of the very large foreign trade of the United Kingdom, Germany, the Netherlands, France, and Belgium, it developed an extremely important entrepot trade in tropical products. A survey of the commodities thus

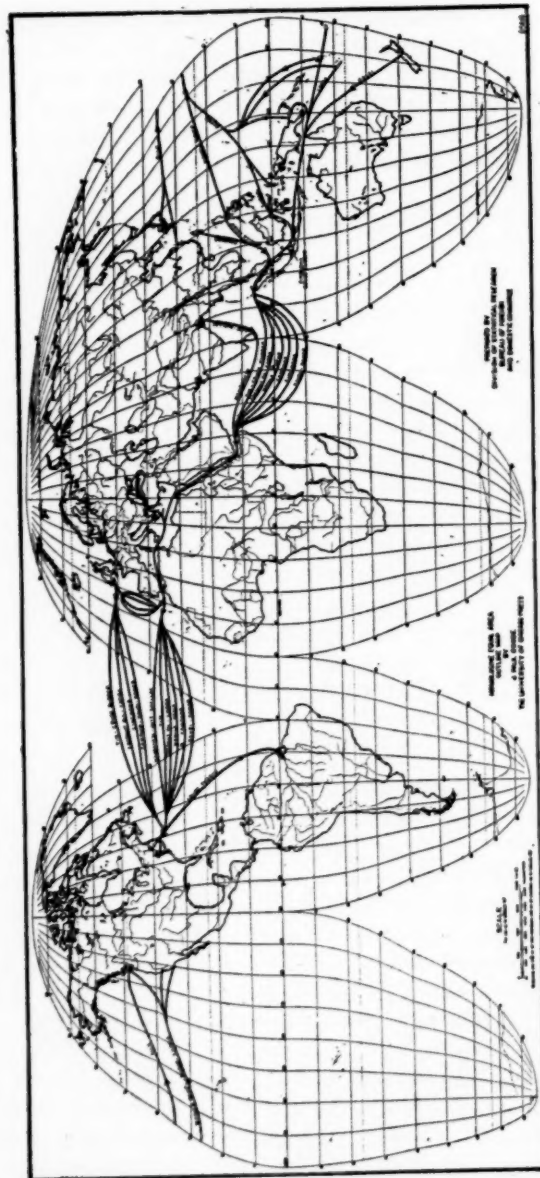


FIG. 1 Trade Routes and Entrepot Markets for Tropical and Exotic Products Imported into the United States from the Middle and Far East,—1910-1914

handled shows that essentially all of them originate in the Far East and Africa, being brought to northwest Europe and from that place re-exported to countries on the European continent or to North or South America.

There are three great commercial tropical producing regions: The Middle and Far East, the Gold Coast of Africa, and Middle America together with tropical South America. In general, climatic conditions are the same throughout these three areas, so that potentially the same crops can be raised.

TRADE WITH MIDDLE AMERICA.—With the Middle American tropics trade has been direct as that is the only natural course for it to take, due to their proximity. Thus, industrial United States has come to depend on sugar, bananas, cacao, chicle, and sisal from these regions. Cacao from Ecuador and Chilean nitrate became more easily accessible to the United States with the opening of the Panama Canal, while over on the east coast coffee, quebracho, and some rubber are shipped direct to the United States. Cuba for sugar, and Sao Paulo in Brazil for coffee are the world's principal commercial producing regions. The products from these American tropics enter the United States for the most part at the ports of New York, New Orleans, and Philadelphia.

TRADE WITH MIDDLE EAST AND FAR EAST.—The tropical Middle East and the subtropical Far East, though similar climatically to the American tropics, differ from them in several respects which have an important bearing upon their commercial importance. Their population is large and dense, providing an abundant supply of lowpriced labor. The British and Dutch have maintained law and order in their respective domains in the Middle East, thus providing a stable basis for investment and agricultural development. The Middle East includes roughly India, the peninsula of southeast Asia, and the islands from Sumatra to New Guinea.

Furthermore, the land masses as a whole in the Malay Peninsula and the East Indies are broken up into smaller units as compared to the great unbroken expanse having similar climatic conditions in northern South America, so that all parts are more easily accessible, and agricultural development has encountered fewer obstacles. In this region capital from Europe and North America can be invested with some degree of safety and can utilize labor and climate in producing commodities for which there is a large demand in Europe and North America. Two plants, native to South America—rubber and cinchona—have been cultivated here on a large scale, as well as the palm trees

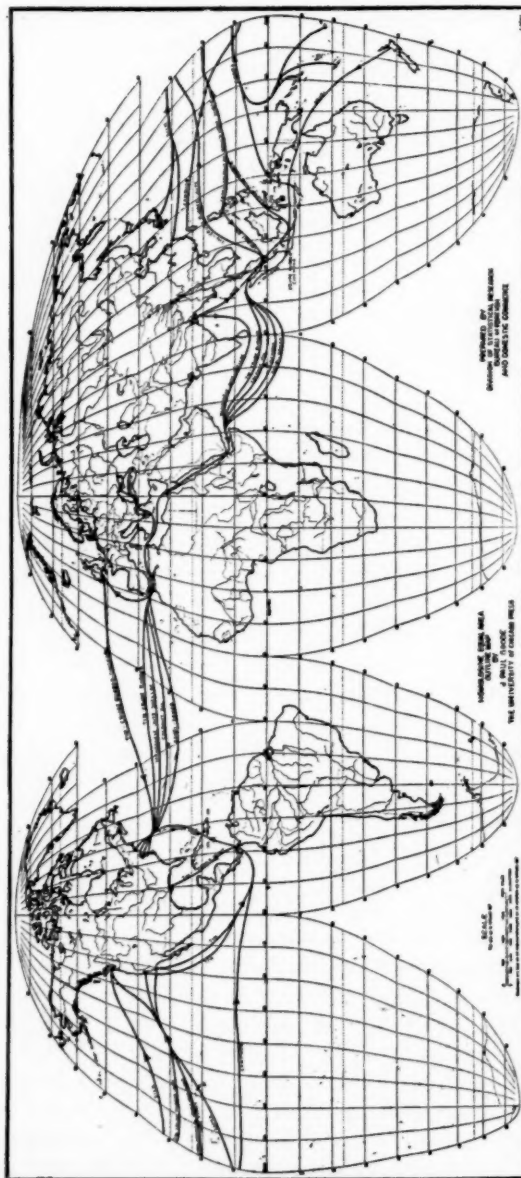


FIG. 2 Trade Routes and Entrepot Markets for Tropical and Exotic Products Imported into the United States from the Middle and Far East, — 1923

of western Africa which are the source of palm oil. Furthermore, this region is approximately equidistant from New York via either Suez or Panama.

IMPORTS OF CRUDE RUBBER.—Before the war, crude plantation rubber came to the United States principally as re-exports from the United Kingdom and the other mercantile countries of northwest Europe. The war disrupted trade between this region and the Middle East, closing Suez and the Mediterranean. As a result rubber was shipped direct to the Pacific ports of the United States, and American buyers were established in the plantation rubber district of the Middle East. After peace was declared some of the crude rubber trade tended to seek its former channels, and in 1923 the United States imported more crude rubber from the United Kingdom and the Netherlands, respectively, than was the average for the five years prior to 1914. Notwithstanding this the volume of crude rubber importations from other regions far exceeded those before the war and considerably more crude rubber in 1923 came direct from Singapore and other Middle Eastern rubber ports than was received through the entrepôts of northeast Europe. The increase in direct importations covers the loss incurred by Germany, Belgium, and France, and a greatly enlarged demand in the United States.

Since the war direct shipping lines have been established between New York and Singapore, via Suez, while intra-coastal lines plying via Panama connect at Pacific ports with lines from the Orient. The service via Suez is more frequent than that across the Pacific and the partial cargoes of rubber can move more economically by this route. Consequently the major part of crude rubber importations coming direct move from Singapore through Suez to New York, though some go to Los Angeles, San Francisco, Seattle, or Portland, and are there transshipped to intra-coastal steamers bound for Atlantic ports, principally New York, Philadelphia, and Baltimore.

IMPORTS OF COCONUT OIL.—Coconut oil is another product in which a shift of market relations has occurred, emphasizing direct importations. Deep tank steamers for carrying this product are somewhat at a premium. Some of them bring the oil by the great circle route across the Pacific. Most of that unloaded at San Francisco, Los Angeles, Portland, and Seattle is consumed on the Pacific Coast. Some shipments, however, are sent through Panama to New York or New Orleans. Yet another portion of the direct importations reaches New York via Suez. In some instances tank steamers carrying fuel oil from California to fueling stations in the Orient are cleaned out and their deep

tanks filled with coconut oil. They then may proceed to Singapore and take on rubber, or to Calcutta for jute, possibly unloading the latter two cargoes in England, where they obtain another cargo, and finally head for New York with the coconut oil.

ROUTE OF TIN ORE TO UNITED STATES.—Just as the world depends upon the Middle East for crude rubber does it rely upon the tin placers and lodes of Banca and Billington for tin, for these are the principal commercial deposits. Prior to 1914 most of the tin used in the United States came via Europe, but now the larger part is imported direct. Some travels through Suez, but indications are that more is routed across the Pacific through Panama to New York and New Orleans, though a little is consigned to San Francisco, Portland, and Seattle. Freight charges on tin, unlike those on rubber, are figured by weight, and the higher value of tin relative to bulk makes it possible to transship it on the Pacific Coast to intra-coastal steamers bound for Gulf and Atlantic ports.

TRADE WITH THE GOLD COAST.—Cacao from the Gold Coast of Africa is another commodity for which market relations have changed. The humid tropical lands bordering the Gulf of Guinea have been cultivated by native labor and developed by European capital in a manner similar to those of the Middle East. Before the war most of the cacao reached the United States via the United Kingdom, for British shipping served the west African coast. During the war an American service was inaugurated between western Africa and New York. This has been continued and most of the cacao consumed in the United States is coming direct from the Gold Coast to New York.

THE ROUTE OF SILK AND MANILA HEMP.—Silk always has moved across the Pacific to Seattle and Vancouver, for it must travel by the shortest and quickest route, due to its high value. It is the only commodity regularly using rail transportation between the Pacific Coast and the eastern industrial region. Sugar also uses the same routes as before the war, being imported direct from Cuba to Atlantic and Gulf ports and from Hawaii and the Philippines to the Pacific Coast.

Manila hemp from the Philippines uses the Panama Canal and is consigned to New York, other Atlantic ports, and New Orleans. Practically all of the jute from the Ganges delta goes by way of Suez, though some is sent through Panama. Shipments of copra are divided somewhat equally between Suez and the Panama lines. These three commodities were imported direct before the war, as well as afterward, but the opening of the Panama Canal has diverted some of the traffic from the Suez routes.



MAPS OF AGRICULTURAL AREA

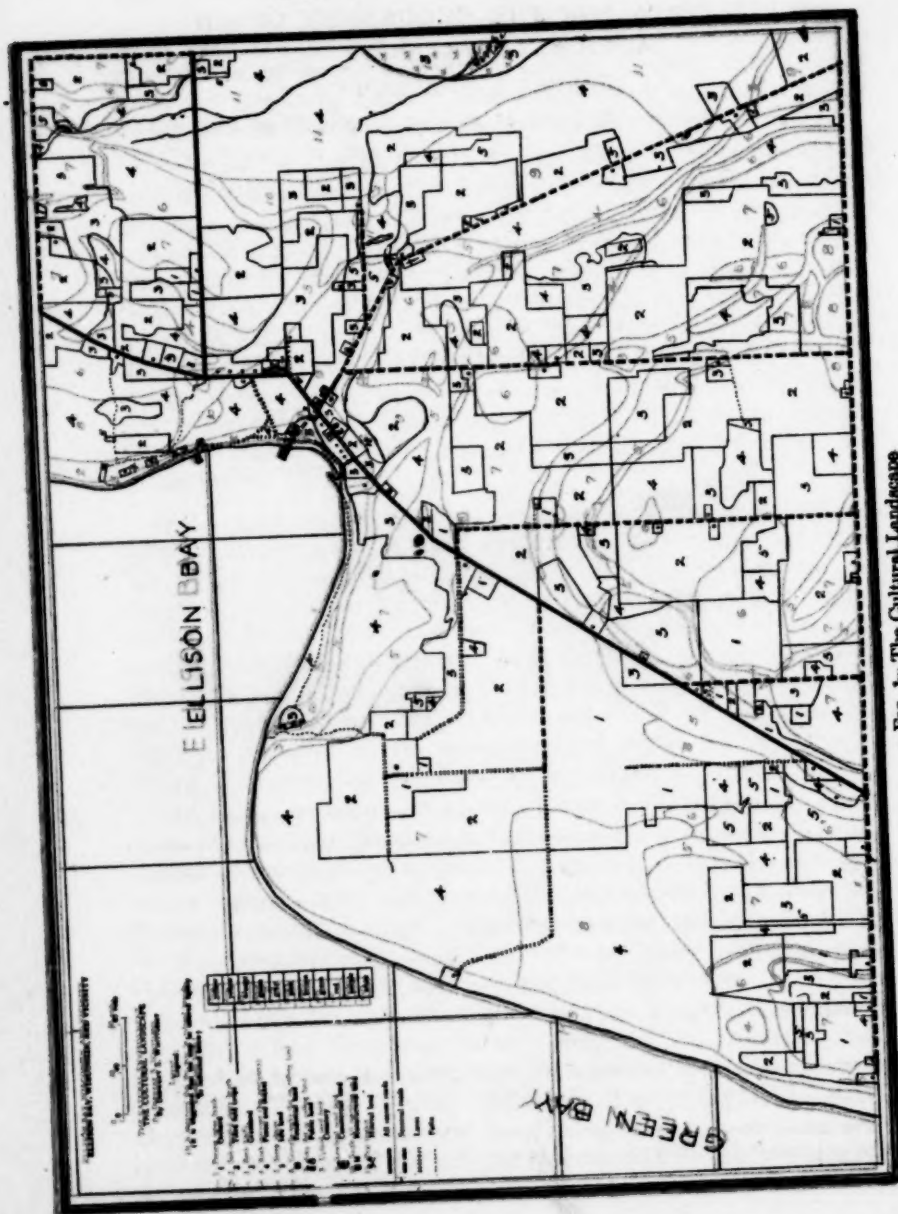


FIG. 1. The Cultural Landscape

It is suggested that black be used for coloring orchard sections to get better results.

FIELD MAPS FOR THE GEOGRAPHY OF AN AGRICULTURAL AREA

BY DERWENT S. WHITTLESEY

INTRODUCTION.—The problem of making maps in the field which will serve the practical needs of the field worker in presenting geographic information both qualitatively and quantitatively, has been discussed on pages 148-151 of this publication.¹

In an attempt to test the conclusions embodied in that article, the author of this paper undertook to make field maps of some six-and-a-half square miles in and around Ellison Bay, Wisconsin, near the north end of the Door Peninsula. In the collection of data he was assisted by members of a field class who worked with him in this area for two weeks during June and July, 1925.²

At the outset it was decided not to combine on a single map facts of the cultural landscape and facts of the natural environment, because of the absence of standards as to precisely what environmental types need recognition in a geographic study. Hence two maps were made in the field, one incorporating features of the cultural landscape (Figure 1), the other embodying conditions of the natural environment (Figure 2.) The scale of six inches to the mile was adopted, and proved none too large for the accommodation of the mappable facts observed.

The maps which these paragraphs are intended to elucidate have been drawn to serve as bases for establishing relationships between the cultural landscape and the natural environment. Hence all facts which appear to have no generally applicable relationship have been omitted. For instance, the land in field crops is devoted to forage, seed vegetables, and small fruits, but this differentiation is not shown because each of these crops is grown on every type of natural environment used for field crops. Again, the steep slopes may be wave-cut cliffs, rock terraces, or morainic hills, but since all are used alike, they are not differentiated.

In determining which elements of the cultural landscape to map the proposals set forth in the article by Finch and Jones, referred to above, were followed with slight modifications; these are shown in the legend for the map.

¹Finch, V. C. and Jones, Wellington D.: Field Mapping in the Study of the Economic Geography of an Agricultural Area. *Annals of the Association of American Geographers*, Vol. XV., Sept., 1925.

²The class comprised L. Bradbury, L. Bressie, W. F. Christians, D. S. Gates, R. A. Martin, L. Olson, L. G. Polspoel, G. T. Renner, M. Renner, R. A. Timme, and L. O. Yoder.

It proved difficult to decide which elements of the natural environment to map. The types chosen are presented as a useful selection for the Door Peninsula only. Presumably they will also be useable in other areas where the Niagara Escarpment is a prominent feature. Whether they have general application or not, can be determined only by the comparison of many similar efforts to map the natural environment in other regions. In making the selection of types to be mapped, an attempt was made to recognize environmental complexes, i. e. those combinations of land forms, soil drainage, natural vegetation, and climate which are distinctive and, at the same time, susceptible of geographic use.

THE NATURAL ENVIRONMENT.—The color scheme for the map of the natural environment is worked out with reference to the colors used in the map of the cultural landscape; e. g. the land on which most of the tilled crops are grown is tinted yellow. The legend of the environment map requires amplification, for the names adopted describe only the dominant conditions of the environment, and connote the other features of the environmental complex only by implication, if at all. This is a weakness, but seems inevitable if unduly long names are to be avoided.

1. The *present stony beach* is strewn with driftwood, but is devoid of vegetation except for quick-growing herbs.

2. The *soil-mantled stony beach* is very thinly covered with soil, and in many places it bears a growth of conifers (chiefly cedar) and birch.

3. The *rock bluffs* are notably xerophytic, tree vegetation being exclusively coniferous.

4. The *rock outcrops* other than precipices vary as to angle of slope, but are well drained and covered with little or no soil.

5. The *steep slopes* are well drained but gullied only slightly, if at all. Air drainage is a notable concomitant of slope in the Door Peninsula, which rises abruptly to elevations of more than 200 feet above the local base formed by Lake Michigan and Green Bay.

6. *Gravelly-rocky flat or rolling* land contains much limestone rock, either slightly abraded glacial boulders or weathered bedrock. Nearly all of it is dolomitic. Drainage is rapid.

7. The *silty flat or rolling* land was originally covered with deciduous forest. It is well drained, somewhat rocky, and shows relief of a few feet only.

- 8 and 9. *Sand lands.* Originally covered with coniferous or mixed forest, these lands resemble the silty areas in relief. The soil is neutral

or only slightly acid in reaction, due to limestone origin. Upland sands are excessively drained; lowland sands may be moister.

10. *Swale*. Lands slow to drain, with standing water in small depressions, high in humus, and in some cases originally covered with grass.

11. The *peat thicket* is land so wet that the soil is distinctly peaty. Today it is covered with an almost impenetrable stand of scrubby trees of many species.

With these characteristics of the natural environment in mind, a comparison of the two maps may be made with the object of pointing out significant relationships between cultural landscape and natural environment.

GEOGRAPHIC CONCLUSIONS.—The village of Ellison Bay straggles along the main travelled road, which, in running the length of the northeast-trending Peninsula, disregards the rectangular land survey adopted for the region, and drops down from the high ground to the lowland about the head of the bay from which the village derives its name, by way of moderate slopes. Near the head of the bay a road which follows the Lake Michigan shore of the Peninsula joins the main road, forming the cross-roads of the village. This highway works its way down the long axis of a steep slope. The remaining roads, which follow section or half-section lines, lie wholly on the upland or on the lowland, with one exception. The only all-year road besides the main Peninsular Highway is a section-line road which leads to the ferry at the end of the Peninsula. The village itself lies on sand land, which provides well-drained cellars and conduces to the production of potatoes and bush fruits in gardens. The soil-mantled beaches furnish gravel for road making, and sites for summer cottages along the bay. Lanes and paths follow these beaches along the shore. None of the land near the village is suitable for farming, and most of that not in house lots is either marsh, forest, or blowing sand.

Nearly all the farms lie on the upland. The bluffs and steep slopes on the Green Bay side, and the peat thicket and marshes on the Lake Michigan side, are given over to Nature. The wettest marshes are grass-covered, but most of the land in these sections is clothed with a dense second growth of trees, deciduous except where rocky exposures give the conifers a chance. On the margins of the peat lands the farmsteads are few (six), and pioneering conditions prevail. In what might be termed the peat border area there are eleven tilled fields, nine pas-

tures (some of them only partly cleared), seven pieces of idle land, and only three small orchards.

On the higher land, where almost flat expanses are interrupted by rocky ledges and short, steep slopes, lie most of the farms. North of the Ellison Bay-Rogers Lake Depression only three farmsteads are within the area mapped. South of the Depression there are twenty-one. Between the forests that bound these two upland areas land in field crops predominates, both as to number of pieces and acreage. Grasslands come second, with orchards a close third. There are but twenty patches of forest in the whole area, most of these being small, and only eight bits of idle land.

Most of the fields, grasslands, orchards, woodlots, and idle patches are rectangular in outline, mute testimony to the force exerted by the rectangular survey, despite counterweight in the form of varying environmental conditions within nearly every twenty, forty, or eighty acre tract. Nevertheless, the occasional curvilinear plots, and the much more numerous broken lines which circumscribe the several units of land, either measure the inertia of an unfavorable environment which compelled the abandonment of many an acre after it had been laboriously cleared of trees, stumps, and stones, or record the battle fronts where resistant Nature defeated hardy pioneers in the struggle to conquer a "clear forty."

If it is fair to assume that the farmer's ideal is to clear his land, a study of the relation between forest and idle land (which is invariably stumpage, scrub, or rough and stony) and the environmental types, should disclose facts of interest. Of the patches of forest within the upland area predominantly cleared, three lie on rocky outcrops of moderate to steep slope, one on sandland, two on gravelly-rocky soil, seven on steep slopes, and two on combinations of gravelly-rocky soil and steep slope—a total of fifteen. To balance this implication that unfavorable environmental conditions are solely responsible for the residues of forest, there are five patches on silty flat or rolling land, the very type most prized for farming. Of the idle lands, one piece corresponds to a rocky outcrop, two to gravelly-rocky soil, two to steep slope, and one to a combination of rocky soil and steep slope—a total of six; on the other hand two lie on silt land.

A study of orchards, along the line followed in the preceding paragraph, but for the whole area mapped, further illustrates the utility of quantitative data. There is one extensive orchard in corporate ownership. Approximately one-third of its total acreage is either steep

slope, rock outcrop, or gravelly-rocky soil, the remaining two-thirds being on the flat, silt upland. The orchards owned and worked by individual farmers classify as follows: on steep slopes—seven; on rocky-gravelly soil and rocky outcrop—three; on sand—two; on silt—four. Since orchards require free drainage, both of air and water, and since the rocky limestone soil is quite as satisfactory for fruit trees as is the silt, the relationship to the sloping and rocky ground is definite and compelling.

The homesteads likewise show a rather unexpected distribution, unless it be remembered that land suitable for field crops is not abundant, and that exactly half the farmsteads are adjoined by orchards. Apart from the houses in the village and along the bay shore on sand land or rock beaches, there are five village houses on steep slopes. The farmsteads classify as follows: on steep slopes—eight; on gravelly-rocky soil—seven; on rocky outcrops—two; on sandland—five; on swale—one; on silt flat or rolling land—seven. A total of twenty-three on land unsuitable for field crops to seven on fertile, deep soil.

VALUE OF THE FIELD MAPS.—From the foregoing analysis it would seem that the production of field maps which show distributions of cultural and environmental features can serve a manifold purpose. Such maps present at a glance the necessary areal relationships; they may be made to carry all mappable facts needed in presenting the regional geography of the area; they suggest lines of inquiry which would never occur to the student who has not made an accurate and detailed distribution of these items; they compel the attention to turn to relationships between the natural environment and the work of man; they furnish a basis for quantitative analysis, without which geographic study is destined to remain among the philosophies.³

³It should be clearly borne in mind that this article is not intended to serve as a regional study of the area mapped, but merely to point out uses to which maps of the type presented may be put in making such a regional study.

THE HISTORY OF GEOGRAPHY: A POINT OF VIEW

BY JOHN K. WRIGHT

NEED OF STUDIES IN THE GEOGRAPHY OF THOUGHT.—Danger besets the man who would study the relation between geographical environment and human thought. So complex are the factors which mold our mental processes, so imperfect our understanding of the relation between geography and the physical—let alone intellectual—activities of humanity; and so great the risk of unfounded generalization, that critical geographers have fought shy of the subject. They regard with interest not wholly untinted by disapproval the hardy student who would venture upon these shifting quicksands of hypothesis. Seductively ingenious are some of the views of older anthropogeographers, who, in their fresh enthusiasm for a newly opened realm of ideas, explained morals and religion, political theory and jurisprudence, imagination and understanding, in terms of environmental "influence."¹ But we no longer take this sort of theorizing very seriously. The present tendency would seem to admit the importance of this phase of geographical research but to leave it for geographers of the future.

And yet, is it altogether wise even now for us to avoid this aspect of our science? Is not the mind of man his most distinctive possession? Can the geographer, whose work is the study of man in relation to the terrestrial environment avoid considering man's thought in relation to the terrestrial environment? Of late, historians have been putting ever more emphasis on intellectual history.² In recent synthetic works of history, relatively more space is being devoted to the progress

¹ For a "brief sketch of the rise of theories regarding the influence of geography upon the historical development of peoples" see H. E. Barnes, *The New History and the Social Studies*, New York, 1925, pp. 40-54. We may refer more particularly to the theories of Jean Bodin (1530-1596) and of Buckle (1821-1862) which seem rather far-fetched in the light of more critical modern thought (see Anton Meuten, *Bodins Theorie von der Beeinflussung der Staaten durch ihre geographische Lage*, Dissertation [Bonn], Bonn, 1904; H. T. Buckle, *History of Civilization in England*, 2 vols, New York, 1864, Vol. 1, pp. 85-108). There is also much in the brilliant works of Friedrich Ratzel that more conservative students cannot accept (see criticism by Jean Brunhes in *La géographie humaine*, 3rd edition, 3 vols., Paris, 1925, Vol. 1, pp. 40-46; and in the English translation of the 2nd edition, *Human Geography*, Chicago and New York, 1920, pp. 31-35; see also Brunhes' discussion of Ratzel in: H. E. Barnes, ed., *The History and Prospects of the Social Sciences*, New York, 1925, pp. 314-332). A classification of social theories giving the names of adherents to theories of geographical, biological, racial, psychological, and cultural determinism on human life, with an extremely valuable array of bibliographical references, is given by F. H. Hankins in his chapter on Sociology, Barnes, Ed., *op. cit.*, pp. 60-65.

² See Barnes, *The New History and the Social Studies*, pp. 387-420, 567-569.

of religion, science, philosophy, and art; relatively less to the external events of politics, dynasties, and wars. The *history of thought* is becoming recognized as a supremely important branch of history. If geography is to compare with history in depth and human value, should the geographer overlook the *geography of thought*?

GEOGRAPHICAL STUDY OF THE HISTORY OF GEOGRAPHY.—If this argument is sound, the question springs up: how is the geography of thought to be studied without its leading us into the quicksands and morasses to which I have referred? I shall not try to answer this question. To do so would be presumptuous. It is a question that can be answered only in the doing—and that gradually, as little by little the edifice of human geography is constructed out of bits of sound observation and constructive, critical thinking.

But if the question is not to be answered in this day and age—and perhaps never, altogether satisfactorily—it is at least possible to suggest one of many approaches toward its solution. This is an avenue of investigation which has not been followed very far and one which seems alluring, even though a treasure will not necessarily be found at its end. We may call this avenue of investigation the *geographical study of the history of geography*.

Let me first explain the expression *history of geography* and then what I mean by the geographical study of the subject.

The terms *historical geography* and *history of geography* are sometimes confused even by historians and geographers. *Historical geography* is the study of geographical facts as they have existed in the past—former distributions of population, boundary changes, trade routes, etc.³ The *history of geography* is quite different: *geography* here means geographical ideas; the words “history of geography” are conventionally employed to designate the history of thought about geographical facts rather than the history of geographical facts themselves. It might be called the history of *geographiology* or *geographiography* on the analogy of *historiography*; but these are frightful barbarisms and, as convention has ruled that the history of geographical thought be

³ The distinction between historical geography, the history of geography, and the geography of history (the last a new term adopted by Brunhes to refer to the “critical examination of the part due to geography in history”) is made by Jean Brunhes in a chapter contributed by him to Barnes’ *History and Prospects of the Social Sciences*, pp. 55-105 (see especially pp. 100-103) and in part reprinted in French in *La géographie humaine*, 3rd edition, Vol. 2, pp. 921-927.

called the history of geography it is perhaps better to use the phrase in this conventional sense.⁴

By the *geographical study of the history of geography* I mean the study of the history of geography from the geographical point of view. The history of geography is often regarded as a somewhat antiquarian and useless background to modern geography; or as an element in the history of science; or as throwing light on historical events like the discovery of America; or as the harmless hobby of collectors of old maps. The *geographical study of the history of geography*, on the other hand, is the study of the history of geographical ideas themselves viewed as geographical phenomena.

CONTRIBUTION OF THE HISTORY OF GEOGRAPHY TO THE GEOGRAPHY OF THOUGHT.—Why should the geographical study of the history of geography offer a way of approaching the thorny problem of the geography of thought? Because of all the many kinds of thought—political, religious, philosophical, commercial, etc.—geographical thought is most closely related to the geographical facts of the earth's surface themselves. There is no other kind of thought more directly responsive to the geographical environment. Furthermore, of all kinds of thought this is the kind that trained geographers are most competent to analyze. They know more about it, to start with.

In so far as geographical thought is a conscious intellectual response to the geographical environment, it is itself a geographical phenomenon and worthy of examination as such. But like other geographical phenomena it is not exclusively geographical in origin or in nature. Other elements enter into the picture. The quality of geographical ideas in any age or region is determined by the human as well as by the terrestrial environment, and the human environment is the resultant of historical causes. Social, political, and intellectual factors have at all times reacted upon geographical ideas.

RELATIONS BETWEEN GEOGRAPHICAL ENVIRONMENT AND GEOGRAPHICAL THOUGHT.—A few examples may now be given of relations that have subsisted between the geographical environment and geographical thought; then, some examples of relations between the human environment and geographical thought.

⁴ Brunhes, *loc. cit.*, writes that "the History of Geography is merely a chapter in the History of Sciences." If the word "sciences" be interpreted broadly enough to include the entire realm of human ideas, this definition is sound. On the other hand, the history of geography should include the history of a variety of interests and activities that, in the ordinary usage of the term, are not "scientific." A discussion by the writer of the scope of the history of geography will appear in a forthcoming number of *Isis: International Review, Devoted to the History of Science and Civilization*.

There are certain direct relations between geographical facts and theories which would hardly seem to require comment. The simplest and most obvious geographical features—such as lakes, rivers, mountains, seas, or plains—are so simple and obvious that it is difficult to imagine how their existence—if not their nature—could fail to be observed, empirically at least, by anyone able to see them. And yet it is possible that primitive mentalities may fail to grasp what we hold to be the significance of these features. T. T. Waterman has shown that the Yurok Indians who live along the Klamath River in north-western California give no names to mountains in the country which they inhabit, although innumerable lesser localities and objects like boulders and rocks on the seashore have distinctive names. They have no name for the Klamath River, yet all directions, even along the sea coast, are indicated with reference to this stream as “up-stream” or “down-stream.” “In our own practice,” Waterman writes, “stream names are considered fundamental. When a country is explored or newly charted the streams are named first. . . . The Yurok . . . treat streams very differently. There is nothing which can be called a name for their main river, a fact which is not in itself surprising, for it is for them the ‘only’ river. But, with a few exceptions, there are also no names for its tributaries. I do not mean that the Yurok never refer to the streams, but that the term applied to the stream is the name of some place on it, or at its mouth.” Much the same is true of mountains. “A sea-stack the size of a piano will have a name, while a hill of two thousand feet elevation has none.” In short, the Yurok “applies place names with meticulous care to a vast number of definite spots and objects, but the larger features of the relief and the drainage system go practically unnamed.”⁵ Waterman does not try to explain the reasons for this: they are probably rooted deep in the social and psychological life of these folk; but doubtless one contributing factor may be the very limited range of territory over which the Yurok are dispersed and the consequent limited extent of their regional knowledge. The basis of comparison being so restricted, mountains and streams are taken more or less for granted, and things that are taken for granted do not cut sharp impressions into the human consciousness.

Apart from the failure of primitive mentalities to “register” what may seem to us obvious geographical impressions, most of the simplest geographical features have been observed by civilized men from very

⁵ T. T. Waterman, *Yurok Geography*, Berkeley, Cal., 1920 (University of California Publications in American Archaeology and Ethnology: Vol. 16, No. 5), pp. 195-198 (see *Geographical Review*, Vol. 10, 1920, p. 414).

early times, and in much the same way that we now observe them. The extent of regional knowledge in the Homeric age was limited, the relative positions of places within the known world were confused; and, yet, Homeric geography was more like modern than like Yurok geography. But if the relations between the geographical environment and—to use the words of Professor Davis—the *empirical* geographical ideas of enlightened folk have been fairly direct and obvious, not so have been the regulations between the environment and *explanatory* geographical thought.⁶ To trace the impress of geographical facts on the interpretation rather than on the mere external description of geographical features is a more subtle and delicate problem, Let us examine two or three examples of this impress.

One of the geographico-astronomical problems for which men long sought the explanation is the sequence of day and night. Among the many extraordinary explanations that have been adduced, one that seems unusually absurd is found in the works of various medieval writers and is carefully developed in that remarkable book, the *Christian Topography* of Cosmas Indicopleustes.⁷ According to Cosmas the earth is mostly flat but rises to an immense mountain in the far north. Around this mountain the sun circles diurnally and night comes on when the rays are cut off by the mountain's bulk. We have here a combination of older theories. Belief in a great boreal mountain was a commonplace in ancient geography. Professor Lutz suggests that the Ionian Greeks borrowed it from the early Babylonians. The northern limits of the world as set by Babylonian cosmography were the mountains of Armenia and Kurdistan. Cosmas thus received and elaborated an idea which arose out of a purely local topographical relationship and was projected down the centuries.⁸ This same process would seem to have taken place in the case of the Deluge stories which may have originated in traditions of local river floods.⁹

Another example of the same sort. Through antiquity and the Middle Ages, curious minds were intrigued by the problem of whence came

⁶ W. M. Davis, *Geographical Essays*, edited by D. W. Johnson, Boston, no date [1911], pp. 15-16; idem, *The Explanatory Description of Land Forms*, in *Receuil de travaux offert à M. Jovan Cvijić*, Belgrade, 1924, pp. 287-336.

⁷ Cosmas Indicopleustes, *Christian Topography*, bk. V: see *The Christian Topography of Cosmas, an Egyptian Monk*, translated and edited by J. W. McCrindle, London, Hakluyt Society, 1897, pp. xviii, 132, 134.

⁸ H. F. Lutz, *Geographical Studies Among Babylonians and Egyptians*, in: *American Anthropologist*, Vol. 26, 1924, pp. 160-174.

⁹ M. B. Weinstein, *Der Untergang der Welt und der Erde in Sage und Wissenschaft*, Leipzig and Berlin, 1914 (*Aus Natur und Geisteswelt*, Vol. 470), pp. 10-24.

the waters which gush forth in springs and mingle in rivers; and of why the continuous pouring in of water does not raise the level of the sea. The explanation of circulation through the atmosphere was put forward but not regarded as altogether sufficient; it might account for some of the waters but surely not for all. Greek geographers therefore developed a theory that the interior of the earth is not unlike a sponge, riddled with caverns and channels, into which water from the sea penetrates the very heart of the land. Losing its salinity as it passes through the earth, the water oozes out in springs and gushes forth in fountains. A constant circulation is thus maintained: from the sea, through the lands, to the surface, and back to the sea again. Medieval hydrography was founded on this idea and some wondrous elaborations were made of it. In combination with and in confirmation of the Scriptural account of the Rivers of Paradise which go forth to water the earth, it gained additional authority. How then, did it originate? Was it altogether the work of creative imagination? The answer may, perhaps, be looked for in the fact that the theory seems first to have grown up in Greece, a limestone country where karstic topography prevails, with its characteristic caverns and sink holes and rivers that disappear beneath the ground.¹⁰

Another similar example from medieval geography. The processes of erosion are so gradual, particularly in humid regions, that they are not obvious to the casual observer. Understanding of the potency of erosion in modifying land forms seems first to have been attained in dry parts of the world where the process is both more rapid and more readily noticed than where it is obscured by a thick cover of vegetation. Medieval Arabs and Persians developed a conception of the true nature of erosion far and away ahead of anything to which the peoples of western Europe had attained. Sir Archibald Geikie quotes an Arabic writer—perhaps Avicenna—as saying: “Mountains may arise from two causes, either from uplifting of the ground, such as takes place in earthquakes, or from the effects of running water and wind in hollowing out valleys in soft rocks and leaving the hard rocks prominent, which has been the effective process in the case of most hills. Such changes must have taken long periods of time, and possibly the mountains are

¹⁰ J. K. Wright, *The Geographical Lore of the Time of the Crusades*, New York, 1925 (*American Geographical Society Research Series No. 10*), pp. 28-32, 59-60, 184-185, 188, 200-202.

now diminishing in size.”¹¹ The Persian Hamd-Allāh Mustawfi writes, as translated by Guy Le Strange: “. . . the sun’s heat . . . beginning to act on the stone, this loses its hardness and is broken up; which process continually accelerated by the succession of many nights and days, cracks appear, splitting the rocks, which same are thus turned to earth.” Hamd-Allāh then goes on to explain the origin of mountains in about the same terms as those of the Arabic writer just quoted.¹²

A modern example of much the same thing is to be found in the United States. America’s distinctive contribution to geography is, perhaps, the interpretation of land forms. American geomorphology, which is essentially the science of cycles of erosion and deposition, was developed during explorations in our arid west¹³ in an environment not unlike that of Mesopotamia and Persia where the Arab and Persian observations of erosive processes were made.

Many more examples of the impress of the geographical environment on geographical thought might easily be cited. But in studying every example of this sort, we should never forget that it is the human mind itself and not the geographical feature which creates the idea within the mind; nor that the mind’s geographical thinking is conditioned by many non-geographical factors. No laws may be established to the effect that where given geographical conditions prevail, specific geographical ideas will necessarily result. Else we should expect to find the people of the karst country of Kentucky developing a hydrographic theory like that of the Greeks and early Christians to which I have already referred.

RELATIONS BETWEEN HUMAN ENVIRONMENT AND GEOGRAPHICAL THOUGHT.—A few examples must now be given of the manner in which purely human and non-geographical factors may affect the development of geographical thought.

The relations between commercial, political, and military affairs and geographical thought are many and varied. The greatest expansions

¹¹ Alfred of Sareshel, *Liber de congelatis*, 2, as translated by Sir Archibald Geikie, *The Founders of Geology*, London, 1905, p. 43. The Latin text of this passage is given by Ingeborg Hamner-Jensen in his *Das sogenannte IV. Buch der Meteorologie des Aristoteles*, in: *Hermes, Zeitschrift für klassische Philologie*, Vol. 50, Berlin, 1915, pp. 132-133. Alfred of Sareshel was a translator of Arabic texts into Latin; he lived in the latter part of the twelfth and early thirteenth centuries. See also Wright, *op. cit.*, pp. 213, 446.

¹² Guy Le Strange, transl., *The Geographical Part of the Nuzhat-al-Qulūb Composed by Hamd-Allāh Mustawfi of Qazwin in 740 (1340)*, London and Leiden, 1919, p. 180.

¹³ W. M. Davis, *The Progress of Geography in the United States*, *Annals of the Association of American Geographers*, Vol. 14, 1924, pp. 160-215, especially pp. 181-191.

of regional knowledge in the progress of exploration and discovery may be largely attributed to commercial and political interests. Columbus did not persuade Ferdinand and Isabella to promote his enterprise, nor did the monarchs accede to his persuasion, out of disinterested love of geographical science. Columbus was seeking primarily gold and spices, concessions and a viceroyalty. Then, again, military necessity has been a powerful stimulant to the advancement of topographical surveys in Europe. Also: mechanical inventions and advancements in the technical arts have forwarded geography. Winsor in his "Christopher Columbus" shows that the invention of the printing-press had more to do with the great discoveries of the fifteenth and sixteenth centuries than would be suspected at first sight. The printing-press rendered available to adventurous seamen lore about countries and peoples and about the distribution of land and water over the earth's surface that had previously been the property of scholars alone. Had Columbus lived a century earlier, it would not have been so easy for him to learn the beliefs of Aristotle and Seneca, Strabo and Ptolemy, Roger Bacon and Pierre d'Ailly, and Marco Polo.¹⁴

Man's craving to ascertain the nature of God and of matter has also molded geographical thought. Geography owes a debt to theology in so far as the "Queen of the Sciences" was one of the few intellectual pursuits in an age of ignorance and tended thus to keep the mind awake and keen. But geography also bears a grudge against theology for the many restrictions that the latter has imposed on the free growth of science in medieval and modern times.¹⁵ Belief in the sphericity of the earth by some medieval theologians was regarded as heresy because certain passages in the Bible may be interpreted to indicate that the earth is flat.¹⁶ Even those in the Middle Ages—and there were not a few—who were ready to concede that the earth is a globe, were none the less inhibited against belief in the existence of antipodal inhabitants. How could dwellers on the other side of the earth see Christ at his second coming?¹⁷ How could the prophecy be true: "All the ends of the earth will bow down before our God," if there dwell in certain ends of the earth men to whom the voice of the prophets and the apostles

¹⁴ Justin Winsor, *Christopher Columbus and how he Received and Imparted the Spirit of Discovery*, Boston and New York, 1891, p. 107.

¹⁵ The classic study of this subject, incidentally of much interest to the student of the history of geographical theories, is A. D. White, *A History of the Warfare of Science with Theology in Christendom*, 2 vols., New York, 1895, (reprinted 1920).

¹⁶ Wright, *op. cit.*, pp. 53-54, 383-384.

¹⁷ Cosmas Indicopleustes, *op. cit.*, prologue 2; McCrindle, *op. cit.*, pp. 5-6.

cannot reach through impassable tracts of water, of cold, and of heat?¹⁸ Even when we turn to that great scholar, Ritter, a founder of the modern school of geography in Germany, we find the impress of theology in the teleological spirit which pervades his work. To Ritter the earth was essentially subordinate to man.¹⁹

Philosophy and metaphysics have also reacted upon geography. The Pythagoreans of Magna Graecia in the sixth century before Christ thought that the earth is a sphere, not on rational or experimental grounds, but because the sphere is the most perfect mathematical form. To quote Winsor once more: "there were long periods [in antiquity] when no one dared to teach the doctrine [of the sphericity of the earth]. Whenever and wherever the Epicureans supplanted the Pythagoreans, the belief fell with the disciples of Pythagoras."²⁰ And to come down to modern times, we find among certain German geographers a merging of philosophical and geographical theory. The concept of the state as an organism not unlike a living creature has met with wide acceptance in Germany. Its geographical aspect, especially as worked out by the Swede, Rudolf Kjellén, has been a factor in recent German writings on political geography.²¹ It is, perhaps, a modern echo of the realist, as opposed to the nominalist, philosophy of the schoolmen of the Middle Ages.

Examples like these of the impress of other human interests on geographical thought might be multiplied almost indefinitely.

CONCLUSION.—In conclusion, we may compare the mind of man to a mirror which has the ability not only to reflect but to retain, record, and interpret more or less imperfectly the images that it reflects. It is not a clean, bright mirror which gives exact images, but too often is warped, clouded, spotted, cracked and broken. The appearance of the image, no matter of what the reflection may be, is determined very

¹⁸ *Magistri Manegaldi contra Wolfelmum Coloniensem opusculum*, L. Muratori, *Anecdota quae ex Ambrosianae Bibliothecae codicibus nunc primum eruit*—, vol. 4, Padua, 1713, pp. 175-176. See also Wright, *op. cit.*, p. 161 for English translation and pp. 429-430 for Latin text of the passage relating to the antipodes.

¹⁹ See especially *Geographical Studies by the Late Professor Carl Ritter of Berlin* Translated from the original German by W. L. Gage, Cincinnati and New York, 1861, pp. 29-32; and Emil Wisotzki, *Zeitströmungen in der Geographie*, Leipzig, 1897, p. 301.

²⁰ Winsor, *op. cit.*, p. 119.

²¹ Rudolf Kjellén, *Der Staat als Lebensform*, 4th edition, Berlin, 1924. See also: Friedrich Ratzel, *Politische Geographie*, 3rd edition, edited by Eugen Oberhummer, Munich and Berlin, 1924; pp. 1-16; and Alexander Supan, *Leitlinien der allgemeinen politischen Geographie: Naturlehre des Staates*, 2nd edition, edited by Erich Obst, Berlin and Leipzig, 1922, pp. 1-6. A monthly periodical, *Geopolitik*, is edited by K. Haushofer especially for the encouragement of investigations along the lines mapped out by Ratzel and Kjellén (see *Geographical Review*, Vol. 15, 1925, pp. 340-341).

largely by the nature of the mirror itself and by the spots, dust, and other foreign matter that may have accumulated upon it.

The history of geography is the history of the images of the geographical environment that have been reflected in the minds of men through the ages. These images have been distorted and discolored by the quality of the minds in which they have been lodged; they have been blurred by accumulations of extraneous lore in these minds and confused by other thoughts. Yet the mere fact that they are images of the geographical environment, not images of anything else, makes it possible for us to distinguish in some measure between the elements that are true reflections and the appearances that are due to the mirror. In other words, if we are looking for the kind of thought best suited for study from the geographical point of view, may it not be a good plan first to select geographical thought itself?